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Nevada Test Site Annual Site Environmental Report for Calendar Year 1996

Prepared for:

**U.S. Department of Energy
Nevada Operations Office**

Prepared by:

Bechtel Nevada

Post Office Box 98521
Las Vegas, NV 89193-8521



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Editors:

Stuart C. Black and Yvonne E. Townsend

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Work Performed Under Contract No. DE-AC08-96NV11718

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Bechtel Nevada

*Post Office Box 98521
Las Vegas, NV 89193-8521*



AUTHORS AND CONTRIBUTORS

1.0 Summary

Stuart C. Black, BN

2.0 Introduction

Colleen M. Beck, DRI
Stuart C. Black, BN
James W. Kesler, BN

3.0 Compliance Summary

Colleen M. Beck, DRI
Stuart C. Black, BN
Orin L. Haworth, BN
James W. Kesler, BN
Amadeo Sanchez, BN
George D. White, BN

4.1 Radiological Monitoring

Stuart C. Black, BN
Robert F. Grossman, BN
Orin L. Haworth, BN
Anita A. Mullen, EPA

4.2 Nonradiological Monitoring

Orin L. Haworth, BN
Charles A. Giesler, BN

4.3 Environmental Permits

Elizabeth C. Calman, BN
Orin L. Haworth, BN
James W. Kesler, BN
George D. White, BN

5.1 Radiological Effluent Monitoring

Robert F. Grossman, BN

5.2 Radiological Environmental Surveillance

Christopher A. Fontana, EPA
Robert F. Grossman, BN
Polly A. Huff, EPA
Terry Mouck, EPA
Anita A. Mullen, EPA
Mark D. Sells, EPA
Cathy A. Wills, BN

6.0 Dose Assessment

Stuart C. Black, BN
Anita A. Mullen, EPA

7.0 Nonradiological Monitoring Results

Richard B. Hunter, BN
Orin L. Haworth, BN
James W. Kesler, BN

8.0 Radioactive and Mixed Waste Storage and Disposal

Brian L. Dozier, BN
Deron Linkenheil, BN

9.0 Groundwater Protection

Max G. Davis, EPA
Brian L. Dozier, BN
Douglas W. Duncan, DOE

10.0 Laboratory Quality Assurance

Stuart C. Black, BN
Robert Elkins, BN
Mark D. Sells, EPA

FOREWORD

Prior to 1989, annual reports of environmental monitoring and assessment results for the Nevada Test Site (NTS) were prepared in two separate parts. Onsite effluent monitoring and environmental monitoring results were reported in an onsite report prepared by the U.S. Department of Energy, Nevada Operations Office (DOE/NV). Results of the Offsite Radiological Surveillance and Long-Term Hydrological Monitoring programs conducted by the U.S. Environmental Protection Agency's (EPA's) Laboratory (various names) in Las Vegas, Nevada, were reported separately by that Agency.

Beginning with the 1989 Annual Site Environmental Report for the NTS, these two documents were combined into a single report to provide a more comprehensive annual documentation of the environmental protection activities conducted for the nuclear testing program and other nuclear and non-nuclear operations at the NTS. The two agencies have coordinated preparation of this eighth combined onsite and offsite report through sharing of information on environmental surveillance and releases as well as meteorological, hydrological, and other supporting data used in dose-estimation calculations.

ACKNOWLEDGEMENTS

The skill, dedication, and perseverance of Angela L. McCurdy in text processing and graphics support were crucial to the production of this report. The review and advice offered by the DOE/NV's Environmental Protection Division (EPD) and the EPA's Radiation & Indoor Environments National Laboratory, Las Vegas (R&IE-LV) reviewers were invaluable. The efforts of N. George McNeill in coordinating the review of the 1996 ASER by the EPD was greatly appreciated. Compilation and verification of onsite data were provided by Robert F. Grossman, Balwan S. Hooda, and Orin L. Haworth. Compilation and verification of Bechtel Nevada's offsite data were provided by James W. Kesler. Statistical analyses of data were provided by Robert R. Kinnison. The cooperative support of Anita A. Mullen of the R&IE-LV in production of this combined onsite and offsite environmental report is greatly appreciated.

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MEASUREMENT UNITS AND NOMENCLATURE

Radioactivity data in this report are expressed in both traditional units (e.g., pCi/L) and International System (abbreviated SI) units. These units are explained below.

background	Ambient background radiation to which people are exposed. Naturally occurring radioactive elements contained in the body, in the ground, and in construction materials, cosmic radiation, and radioactivity in the air all contribute to an average radiation dose equivalent to humans of about 350 mrem per year. In laboratory measurements of radioactivity in samples, background is the activity determined when a sample of distilled water is processed through the system (also called a blank).
becquerel	Abbreviation Bq. The Bq is the SI unit for disintegration rate. 1 Bq = 1 disintegration per second.
concentration	Usually expressed as $\mu\text{Ci/mL}$, or pCi/m^3 .
curie	Abbreviation Ci. The historic unit for disintegration rate. $1 \text{ Ci} = 3.7 \times 10^{10}$ disintegrations per second = $3.7 \times 10^{10} \text{ Bq}$. The usual submultiples of Ci are mCi (10^{-3} Ci or one thousandth Ci), μCi (10^{-6} Ci or one millionth Ci), and pCi (10^{-12} or one trillionth Ci).
EDE	Effective dose equivalent - radiation dose corrected by various weighting factors that relate dose to the risk of serious effects.
rem	Rem (for <u>r</u> oentgen <u>e</u> quivalent <u>m</u> an) is the unit for expressing dose equivalent, or the energy imparted to a person when exposed to radiation. The commonly used subunit is the millirem (10^{-3} rem or one thousandth rem), abbreviated mrem.
roentgen	Abbreviation R. A unit expressing the intensity of X or γ radiation at a point in air. The usual units are mR for 10^{-3} R (one thousandth R).
volume	The SI unit for volume is m^3 (cubic meter). Other units used are liter (L) and mL (10^{-3} L or one thousandth liter). One cubic meter = 1,000 L.

The elements and corresponding symbols used in this report are:

<u>Element</u>	<u>Symbol</u>	<u>Element</u>	<u>Symbol</u>
Aluminum	Al	Iron	Fe
Americium	Am	Krypton	Kr
Argon	Ar	Lithium	Li
Arsenic	As	Mercury	Hg
Barium	Ba	Nitrogen	N
Beryllium	Be	Oxygen	O
Boron	B	Plutonium	Pu
Cadmium	Cd	Radium	Ra
Calcium	Ca	Radon	Rn
Carbon	C	Selenium	Se
Cesium	Cs	Sulfur	S
Chlorine	Cl	Strontium	Sr
Chromium	Cr	Technetium	Tc
Copper	C	Thorium	Th
Fluorine	F	Thulium	Tm
Germanium	Ge	Tritium	^3H
Hydrogen	H	Uranium	U
Iodine	I	Xenon	Xe

LIST OF ACRONYMS AND EXPRESSIONS

AEC	U.S. Atomic Energy Commission
AIRFA	American Indian Religious Freedom Act
Alara	As Low as Reasonably Achievable
ANOVA	Analysis of Variance
ARL/SORD	Air Resource Laboratory, Special Operations and Research Division
ASER	Annual Site Environmental Report
ASL	Analytical Services Laboratory
ASN	Air Surveillance Network
AVO	Amador Valley Operations
BECAMP	Basic Environmental Compliance and Monitoring Program
BN	Bechtel Nevada
BN/WMP/TS	Bechtel Nevada Waste Management Program, Technical Support
BOD	Biochemical Oxygen Demand
BoFF	Bureau of Federal Facilities, State of Nevada
CA	Composite Analysis
CAA	Clean Air Act
CAP88-PC	Clean Air Package 1988 (EPA software program for estimating doses)
CEDE	Committed Effective Dose Equivalent
CEI	Compliance Evaluation Inspection
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
CP	Control Point
CRMP	Community Radiation Monitoring Program
CTLP	Community Technical Liaison Program
CVIS	Computerized Video Imaging System
CWA	Clean Water Act
CX	Categorical Exclusion
CY	Calendar Year
DAC	Derived Air Concentration
DCG	Derived Concentration Guide
DDR	Data Discrepancy Report
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOE/HQ	DOE Headquarters
DOELAP	DOE Laboratory Accreditation Program
DOE/NV	DOE Nevada Operations Office
DQO	Data Quality Objectives
DRI	Desert Research Institute, University and Community College System, Nevada
DSWA	Defense Special Weapons Agency
EA	Environmental Assessment
EDE	Effective Dose Equivalent
EHS	Extremely Hazardous Substances
EIS	Environmental Impact Statement
ELU	Ecological Landform Unit
EMAC	Ecological Monitoring and Compliance
E-MAD	Engine Maintenance, Assembly and Disassembly (on the NTS)
EML	Environmental Measurements Laboratory (DOE)
EMP	Environmental Monitoring Plan

List of Acronyms and Expressions, cont.

EOD	Explosive Ordnance Disposal (NTS)
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Reporting and Community Right-to-Know Act
EPD	DOE Environmental Protection Division
ERP	Environmental Restoration Project
ESA	Endangered Species Act
ESS&H	Environment, Safety, Security, and Health
FFACO	Federal Facilities Agreement and Consent Order
FFCA	Federal Facilities Compliance Act
FONSI	Finding of No Significant Impact
FY	Fiscal Year
gal	Gallon
GBq	Gigabequerel (10^9 bequerels)
GCD	Greater Confinement Disposal
GIS	Geographical Information System
gpm	Gallons Per Minute
GZ	Ground Zero
HSC	Hazardous Material Spill Center
HTO	Tritiated Water
HWAS	Hazardous Waste Accumulation Storage
HWSU	Hazardous Waste Storage Unit
ICRP	International Commission on Radiological Protection
ID	Identification
JIT	Just-in-Time
keV	Kilo-electronvolt
LANL	Los Alamos National Laboratory
LAO	Los Alamos Operations (BN)
LDR	Land Disposal Restrictions
LLNL	Lawrence Livermore National Laboratory
LLW	low-level (radioactive) waste
LTHMP	Long-Term Hydrological Monitoring Program
LVAO	Las Vegas Area Operation
MAPEP	Mixed Analyte Performance Evaluation Program
MCL	Maximum Contaminant Level
MDC	Minimum Detectable Concentration
MEI	Maximally Exposed Individual
MQO	Measurement Quality Objectives
MSDS	Material Safety Data Sheet
MSL	Mean Sea Level
MSN	Milk Surveillance Network (R&IE-LV)
MWMU	Mixed Waste Management Unit
NAC	Nevada Administrative Code
NAFB	Nellis Air Force Base
NAGPRA	Native American Graves Protection and Repatriation Act
NDEP	Nevada Division of Environmental Protection
NDOW	Nevada Department of Wildlife
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants

List of Acronyms and Expressions, cont.

NHPA	National Historic Preservation Act
NIST	National Institute of Standards and Technology
NLVF	North Las Vegas Facility (BN)
NPDES	National Pollution Discharge Elimination System
NR	National Register of Historic Places
NRS	Nevada Revised Statutes
NSHPO	Nevada State Historical Preservation Office
NTS	Nevada Test Site
OPSEC	Operations Security
ORNL	Oak Ridge National Laboratory
ORSP	Offsite Radiological Safety Program
PA	Performance Assessment
PC	Printed Circuit
PCB	Polychlorinated Biphenyl
PE	Performance Evaluation
PEIS	Programmatic Environmental Impact Statement
PESP	Performance Evaluation Studies Program
pH	Hydrogen ion concentration
PHS	U.S. Public Health Service
PIC	Pressurized Ion Chamber
PPOA	Pollution Prevention Opportunity Assessments
ppb	Parts per Billion
ppm	Parts per Million
PRP	Peer Review Panel
QA	Quality Assurance
QAP	Quality Assessment Program
RCRA	Resource Conservation and Recovery Act
R&IE-LV	Radiation & Indoor Environment National Laboratory - Las Vegas (EPA)
REEC _o	Reynolds Electrical & Engineering Company, Inc.
ROI	Return on Investment
RSD	Relative Standard Deviation
RSL	Remote Sensing Laboratory (BN)
RWMS	Radioactive Waste Management Site
RWMS-3	Radioactive Waste Management Site, Area 3
RWMS-5	Radioactive Waste Management Site, Area 5
s	Sample Standard Deviation
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SGZ	Surface Ground Zero
SIC	Standard Industrial Classification
SMSY	Strategic Materials Storage Yard
SOC	Synthetic Organic Chemical (e.g., pesticides)
SOP	Standard Operating Procedure
STL	Special Technologies Laboratory (BN)
TCE	Trichloroethane
TLD	Thermoluminescent Dosimeter
TPH	Total Petroleum Hydrocarbon
TRU	Transuranic
TSCA	Toxic Substances Control Act

List of Acronyms and Expressions, cont.

TSD	Treatment, Storage and Disposal
TTR	Tonopah Test Range
UGTA	Underground Test Area
U.S.	United States of America
USAF	United States Air Force
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	Underground Storage Tank
UTM	Universal Transverse Mercator
VOC	Volatile Organic Compound
WAC	Waste Acceptance Criteria
WAMO	Washington Aerial Measurements Operations (BN)
WIPP	Waste Isolation Pilot Plant
WMP	Waste Management Program
WMP/TS	Waste Management Project Technical Support (BN)
YMSCO	Yucca Mountain Site Characterization Office